A

Synopsis

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" STUDIES ON CONTROL MEASURES OF LEAF SPOT AND RHIZOME ROT OF TURMERIC cv SALEM."

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STUDIES ON CONTROL MEASURES OF LEAF SPOT AND RHIZOME ROT OF TURMERIC cv SALEM.

INTRODUCTION :

Turmeric (*Curcuma longa L.*) belongs to the family *Zingiberaceae* and important commercial spice crop in India. It is considered auspicious and used in several religious ceremonies. Further, the crop is used for its medicinal, culinary and cosmetic properties (Madhusmita Mahanta*et.al.*2022). Turmeric (*Curcuma longa L.*), sacred spice is one of the most important commercial crops known for its aromatic and medicinal properties. It is used as a condiment, dye and cosmetic in addition to its use in religious ceremonies (Anoop K.2005). It is a natural antioxidant with anti-tumorous and anti-microbial properties. The presence of aromatic volatile (turmerone, cur-dione, and ar-turmerone) and non-volatile bio-active elements (curcuminoids) in the rhizome makes it a blood purifier and skin fairing agent (Nasreen Musheer *et.al.* 2017 and N. Uma Maheswari*et. al.* 2011).

The disease usually appears in the field during august and september when there is high relative humidity in the atmosphere. The Turmeric rhizome contains a variety of pigments of which curcumin is the major one responsible for colour. Apart from curcumin and volatile oil, it also contains appreciable quantities of proteins (6.30%), lipids (5.10%), carbohydrates (69.40%) and fibre (2.60%) (Nandini M. *et.al.* 2021).

Turmeric is prone to many fungal, bacterial, viral and nematode diseases. The most important fungal diseases are Leaf spot (*Colletotrichum capsici*), Leaf blotch (*Taphrina maculans*), Leaf blight (*Alternaria alternata*) and Rhizome rot (*Pythium aphanidermatum*) (Bassi Santosh *et.al.* 2020).

The leaf spot disease is caused by *Colletotrichum capsica*. The occurrence of the leaf spot is on the upper surface of the leaves of the turmeric plant.Symptoms of leaf spot disease include leaves showing yellow and brown spot appear on the plant's first leaves. The shape of the spot is oval, vertical and circular. If the affected leaf is held up to the sun, many circles can be seen in the spots. In severe cases, the entire leaf turns yellow. The leaf becomes reddish-brown, andthe central necrotic area is surrounded by a yellow halo and a healthy area. Disease severity is less than 60% (B.V. Hudge *et.al*. 2010, P.G. Chavan *et al.* 2017 Anonymous 2023).

Rhizome rot disease is caused by *Pythium aphanidermatum*. Among the Pythium species, (*P. aphanidermatum*) is cosmopolitan in distribution and one of the most common plant parasitic pathogens of several different crop plants in warmer parts of the world. The occurrence of rhizome rot is on the rhizome. Some symptoms of this disease also cause yellowing of the leaves. The tips of the leaves turn yellow from the top and edges and grow from one to five centimetres down. Later, the leaves of the turmeric plant dry up completely. The base of the stem near the ground turns black and grey. the soil at this place turns black from the topwhich looks like it has been affected. If pressed on this area, rotten, foul-smelling water comes

out. pull the root of the turmeric plant affected by root rot, the plant can be easily uprooted. The characteristic yellow leaves can identify this disease (V. Janani *et.al*.).

Some species of Pythium are beneficial while most species are known to parasitise and cause infections in the roots of crop plants and ultimately damage them. (S. R. Prabhu karthikeyan *et.al.* 2015).

REVIEW OF LITERATURE:

Madhusmita Mahanta (2022) studied the management of leaf spot disease of Turmeric (Curcuma longa L.) colletotrichum spp. In india curcumin is the predominant pigment present in turmeric rhizomes, which is why Indian turmeric has a marked place in the international spice market. It is a commercial crop inIndia.

Anoop K. (2005) studied the etiology and disease management of rhizome rot in Turmeric (*Curcuma longa L.*) India is the largest producer, consumer and exporter of turmeric in the world. It is cultivated in the south and north eastern states of india in more than 200 districts spread over 25 states.

Nasreen Musheer *et.al.* (2017) and N. Uma Maheswari *et. al.* (2011) studied the effect of Trichoderma Spp. on Colletotrichum gleosporiodes Penz and Sacc. Trichoderma is a free-living filamentous fungus and it is commonly found in the plant rhizosphere. They have antagonistic potential against several pathogens causing plant diseases like leaf spots.

Nandini M *et.al.* (2021) studied the identification and classification of leaf diseases of turmeric. The idea of integrating information and communications Technology (ICT).ICT plays an important role in the agriculture sector and motivates the development of an automated system for turmeric disease classification. The various diseases that affect turmeric leaf are categorized as leaf spot, leaf blotch and rhizome rot.

Bassi Santosh *et. al.* (2020) studied the efficacy of bioresources on *Colletotrichum capsici,* Plant growth and yield of Turmeric (Curcuma longa L.) in vivo. Leaf spot affects yield and the losses by leaf spot of turmeric caused by *Colletotrichum capsici* are always considered to be a limiting factor for quantitative and qualitative losses all over the country.

B.V. Hudge *et.al*. (2010), Anonymous (2023), P.G. Chavan *et. al.* (2017) studied losses in yield and quality of turmeric due to leaf spot disease.

REVIEWS OF RESEARCH AND DEVELOPMENTS IN THE SUBJECT:

INTERNATIONAL STATUS:

The countries involved in turmeric cultivation other than India are Bangladesh, Pakistan, Sri Lanka, Taiwan, China, Myanmar, Nigeria, and Indonesia. India is the major producer of turmeric globally and 80% of its production is consumed domestically (K. Indhumathi *et.al.* 2023). Turmeric (*Curcuma longa L.*) is a native of the tropical South(K. Ravindra Kumar*et.al.* 2015). Curcumin, oleoresins, and volatile and essential oils are the main extracts from turmeric which is popularly used across the world (Kamran Ashraf *et.al.*2017).

India is the major producer and exporter of turmeric in the world. The major turmeric-importing countries are Bangladesh, Germany, Iran, Japan, Malaysia, South Africa, Singapore, Sri Lanka, UAE and the USA (Anoop, K. *et.al.* 2014). Turmeric from India is mostly exported as fresh and dried whole root (rhizome), in powdered form, and processed form, such as oil and oleoresin, mainly to the UK, USA, Japan,the Netherlands, Iran, UAE, Bangladesh, France and South Africa.

NATIONAL STATUS:

India dominates the international turmeric market in terms of production, consumption and export. About 80 % of the whole turmeric production in the world is produced in India, with an average production of about 946.65 MT (NHB, 2018). In 2019, India exported turmeric worth approximately 194.35 billion US dollars (Aditi Maithani *et.al.* 2021). Indian turmeric is described as the best medicinal herb because of its implicit qualities and the presence of major bioactive compound which is Curcumin. Certain disorders can be treated using turmeric powder, which is also used as an antimicrobial. Turmeric is commonly grown in the states of Tamil Nadu, Uttar Pradesh, Bihar, Maharashtra, Karnataka, West Bengal, Andhra Pradesh and Kerala. The most widely cultivated types in Tamil Nadu are Erode local, Salem local, PTS-10, BSR-1, Roma and Suguna (T.G. Nageshwar Rao 1995 and M. Kannan *et.al.*2023). During the year 2021-2022 was 1334 thousand MT with an area of 349 thousand hectares. In Uttar Pradesh, during the year 2021-2022, the area and the production of turmeric was 1.76 thousand ha and 3.64 MT respectively (Anonymous, 2021-22). Among these diseases, leaf spot is the most important andlosses yield up to 62.12 per cent in various major turmeric growing regions in India. McRae was the first who report this disease from the Coimbatore district of Tamil Nadu in 1917(Anand Milan 2023).

Leaf spot is severe in Kadapa, Kurnool, Guntur, Krishna, Nizamabad and Godavari districts of Andra Pradesh. Leaf spot generally appears in the last week of August or first week of September i.e. when the crop is two months old. *C. capsici* is reported to reduce dry rhizome yield by 62.7% (Nair & Ramakrishnan 1973, S. Narasimha Rao *et.al.* 2012).

The districts of Nanded,Hingoli, Parbhani, Sangli, Satara, and Jalgaon in the state have the highest area under turmeric cultivation.This rain has hit the turmeric crop hard.So far, 20% of the tubers have been affected by therhizome rot. Turmeric growth has been stunted due to the cessation of root functionand also has a lesser or greater amount of turmeric cultivation. The area of turmeric in the state has been increasing in the last three years. In 2023, turmeric was cultivated on 89,273 hectares, pure rainfall production decreased. (Anonymous 2023).

ORIGIN OF RESEARCH PROBLEM AND SIGNIFICANCE OF THE STUDY:

Leaf spot and Rhizome rot is a common disease found in turmeric growing areasin Marathwada. Most of the Farmers in Nanded, Parbhani and Hingoli district cultivated turmeric crop plants. To control Leaf spot and Rhizome rot disease the former generally use fungicides and chemicals. Both fungicides and chemicals killpathogens but showan adverse effect on soil,waterandair and also increasethe cultivation cost value of turmeric. Bio agent is the alternative source to control Leaf spot and Rhizome rot diseases.

So, the present research undertaken to find the proper and alternative method to control Leaf spot and Rhizome rot diseases with the help of bioagent.

OBJECTIVES:

1. To undertake the study of leaf spot and rhizome rot disease in the turmeric growing region of Marathwada, particularly from Nanded, Parbhani and Hingoli districts.

2. To assess and analyze the impact of Deprotinised Juice (DPJ) of neem, Copper Oxychloride, Chitosan, Micro-organism, Biomix and MauFung on leaf spot and rhizome rot disease of turmeric crop plant.

3. Isolation, purification, pathogenicity and identification of fungal pathogen associated with leaf spot and rhizome rot diseases.

4. To study the bio-efficacy of bioagents *in vitro* alone and in combination.

5. To find proper dose and application methods of treatments to control diseases and avoid dependency on fungicides.

METHODOLOGY:

1. Collection of healthy and disease-free turmeric rhizomes from farmers or research institutes.
2. Field preparation and experimental plot design (Randomized Block Design).
3. Ridges and furrows method of cultivation of turmeric rhizome.
4. Collection and analysis of soil samples before sowing of turmeric rhizome.
5. Collection, preparation and evaluate the effect of deproteinized Juice (DPJ) of neem, Copper oxychloride, Chitosan, Microorganism, Biomix and Maufung on turmeric crop plants.
6. Study of total phenol content in turmeric crop plant and enzymes activities chitosanase, Chitinase and B-1, 3-Glucanases activity.
7. Study of metabolic changes in diseased leaf and rhizome of turmeric.
8. Morphological study of turmeric crop plantssuch as the height of the plant, No. of leaves, Length of leaves, Breath of leaves and Leaf area index.
9. Use of statistical methodsfor analysis of experimental results.

1.STUDY OF LEAF SPOT DISEASE

a. Study of Symptomatology**.**

b.Collection and identification of infected leaf of turmeric.

c.Study of Percent diseases incident (%), Diseases severity (%) and Percent efficacy of disease control (PEDC %) caused by *Colletotrichum capsici* in Turmeric crop plant.

e. Isolation and purification of the pathogen.

d. Study of pathogenicity test .

2. STUDY OF RHIZOME ROT DISEASE

a. Study of Symptomatology

b. Collection and identification of infected Rhizome of turmeric.

c. Study of Percent Germination (%), Pre-Emergence Rhizome Rot (PERR), Post Emergence Seedling Mortality (PESM) caused by *Pythium aphanidermatum* in Turmeric crop plant.

d. Isolation and purification of the pathogen.

e. Study of pathogenicity test.

PROPOSED WORK PLAN/ FORMULATION AND STRUCTURE OF STUDY:

YEARS	PROPOSED RESEARCH WORK
1st YEAR	Collection and study of a research paper.
	Selection of Turmeric variety.
	Selection of Field experimental site.
	Collection of healthy and disease-free rhizomes for sowing.
	Visit to agriculture university, KVK, research station and institute for gathering information related to research work.
2nd YEAR	Soil analysis before sowing of turmeric.
	Field preparation and Experimental design.
	Collection,and preparation of Deprotinised Juice (DPJ) of neem, Copper oxychloride, Chitosan, Microorganism, Biomix and Maufung.
	Collection, isolation and purification of pathogens of leaf spot and rhizome rot
	Study of vegetative, metabolism and yield characters of turmeric.
3rd YEAR	Soil analysis after harvesting of turmeric.
	Experimental plot-wise yield collection.
	Experimental result analysis and application of statistical method.
	Chapterwise writing of research work.
	Submission of Thesis.

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